



President's Notes for January 2016

Happy New Year to all! I hope you all enjoyed a safe and healthy end of 2015, and are ready to go forward into 2016!

There is a lot to discuss again this month, so we will get started!

Club Equipment for Sale: We have sold the Kenwood AT-230 tuner to Mac Lunn, KD8TPO, for \$100. We still have the Kenwood TS-830 HF radio for sale. If we do not sell it by the January club meeting, we will work to sell it at a swap, or through eBay. I have finally put the MFJ Voice Keyer up for sale. I checked it out and ran it for 24 hours straight over the holiday week and it continued to work.

Yaesu System Fusion Repeater: Mac Lunn approached the Board of Directors with an offer to fund the cost of an upgrade to our main 2m repeater and incorporate the Yaesu System Fusion digital mode into it. The repeater normally sells for about \$1,700. Yaesu has now twice offered a discount for the repeater down to \$500. The current offer expired on December 31st of 2015. Why is Yaesu doing this? They are doing this to be able to sell more System Fusion compatible radio equipment. The Yaesu System Fusion digital mode competes with other digital modes such as the Icom D-Star, Motorola DRM, and P25. None of these modes are compatible with each other, causing potential compatibility issues that are similar to what the civic emergency services experience between Police, Fire, Homeland Security, and other groups. The compatibility question has greatly limited the penetration of digital into the VHF/UHF bands. What has Yaesu done to try and make System Fusion more compatible, and thus entertained by the amateur community? They have designed their repeater to be automatically backwards compatible with the regular Amateur FM analog mode. The repeater will transmit digital if a digital signal reaches it. It will transmit analog if an analog signal is received. The System Fusion radios will switch from digital to analog when the repeater switches to analog mode. This means that all of our current analog gear continues to work. In comparison to the other digital systems:

D-Star: Repeater only transmits digital. Groups set up separate digital and analog repeaters.

DRM: Most equipment is for UHF, not VHF. Most radio equipment is handi-talkie, with no mobile radios, although the handi-talkies themselves are reasonably priced. Equipment is generally commercial, without the flexibility of the amateur radios regarding displays, programming, etc. There are no specific amateur radios supporting

this mode at present. The repeaters are expensive, and a version with the capability of switching to analog automatically is \$500 over the \$1,900 repeater cost.

P25: Same as DRM, only commercial equipment available, and no analog repeater compatibility.

As part of our research for this offer, myself and other club members did research on the Yaesu System Fusion and did test with it. The I-94, Chelsea, Manchester, and Monroe repeaters have all installed this Yaesu repeater controller over the past year. I had email chats with the I-94 and Chelsea/Manchester repeater managers, and got feedback as to what they found and how they were working, and their plans for the future. All have their systems up and running in Auto Mode Select, which is where they operate as a regular analog repeater unless running in digital mode. Tye Winkel, KC8YEJ, and I also tried this out for ourselves through the I-94 repeater. (Our new Club Yaesu FT-991 is System Fusion compatible, and Mac loaned Tye a Yaesu FTM-400XD mobile radio for his end. See the related article in this Bolt about our findings, but the digital mode was demonstrably superior during our testing. It ended up being more intelligible with weak signal work than the analog FM. The automatic switchover of the repeater between digital and analog mode also worked transparently.

After the conclusion of this research and discussions with the Board of Directors and with Murray Scott, KE8UM, or Repeater chair, we accepted the offer of Mac Lunn purchasing the Yaesu System Fusion repeater for our site as a replacement for our 2m repeater. Per the Yaesu agreement, we have to install it and use it for a period not less than 1 year. We can use as much analog and digital as the club wishes to. The repeater has a 5W, 20W and 50W setting on it. We believe we will still be able to link it with the 220 machine and our S-Com controller, although we will need to purchase a ADR interface in order to do this, at a cost of \$160, plus configure a new cable to the controller. As our current repeater amplifier is a single RF transistor design that takes 20W input to give 100W output, we think this will work as-is in both analog and digital modes with the new repeater. Some newer amplifiers have had trouble with the digital modes.

We will keep the club informed of our progress. Yaesu reports a 1-2 month delay in shipping the repeater to us. However, we just found out on Jan 4th that the unit has shipped and will be with us before the January club meeting! With the time to configure and bench test with Murray, installation will likely be in the spring. When installed, the coverage is expected to be the same, as we will have the same antenna, duplexer, and amplifier. When in digital mode, it will sound like a mechanical hiss. If anyone joins in using analog, the repeater and all of the radios will switch to analog for the remainder of the conversation. The Tin Lizzy club will join

other repeater owners in the area in supporting a digital repeater mode while still maintaining compatibility with our venerable analog FM equipment!

David Treharne
N8HKU
FARL Club President



January Club meeting topics for January 14th

Field Day Review and a discussion on the new Yaesu Repeater. Dave, N8HKU, will present the 2015 Field Day results and summary of what went right and what went very wrong this past year. We will begin to plan for our 2016 Field Day adventure! In addition, we will discuss the new repeater, which we have an introduction to below. We will bring the new club radio, the FT-991 into a future club meeting for a walk through, probably March. (We had planned it for this month, but the agenda is full.)

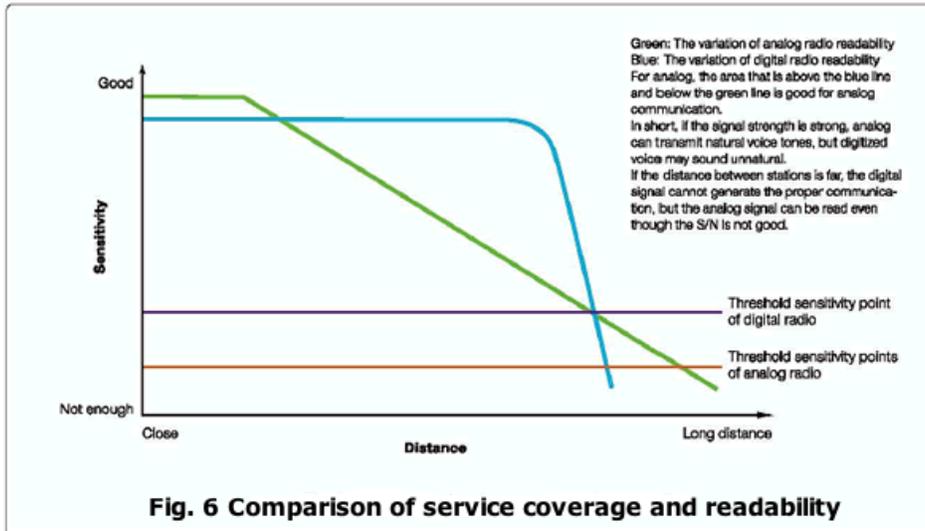
Yaesu System Fusion Repeater DR-1X Discussion Use for FARL Repeater Decision December 22, 2015

Test Results through the I-94 Repeater between Dave, N8HKU and Tye, KC8YEJ: December 20, 2015. Tye was located in Canton, MI, Dave in Ypsilanti Township. The I-94 repeater is at the St. Joseph Hospital main building in Ypsilanti.

The Yaesu System Fusion Repeater works in both normal FM analog mode, and a digital mode called C4FM. This stands for Continuous 4 level Frequency Modulation. It is similar to DRM and P25, but is not compatible with these radios.

Conclusions: C4FM improved the signal readability and eliminated noise on a quiet path as well as a very poor path. It was superior to the FM analog reception in all the cases. Voice quality was good, with a lowering of the overall pitch and a slight mechanical quality to it. See the figure below. The Analog, in green, sounds a bit better at full quieting. But, under less than quieting, the digital sounds much better, as shown in blue. At the edge of reception, the digital will fall out while analog still works. However, in our tests on the I-94 repeater, the analog was almost worthless below the threshold where digital signals come through. The

C4FM is reported to be superior to D-Star in this respect, as it has a newer, more sophisticated coding algorithm.



Courtesy of David Ranch, KI6ZHD

Test findings:

1. Transmit with 5 watts in Analog mode, outdoor antennas: Pretty quiet, noticeable squelch tail on the key up before the courtesy beep.
2. Transmit 5 watts in C4FM Digital narrow mode (comparable in bandwidth to analog FM), outdoor antennas: Very quiet, no hiss, audio shifted a bit lower in pitch, a very slight mechanical twang to it. No squelch tail, just the beep we programmed into the radios. (No courtesy beep or tail in digital mode.)
3. Transmit 5 watts in Digital wide mode, outdoor antennas: A bit better audio in the twang dept, still shifted toward the lower frequencies a bit.
4. Dave then began using an indoor antenna in his basement to simulate a weak channel:
 - a. 40 watts in Analog mode: Very noisy, barely readable by Tye. Dave's reception was S5 with a lot of noise.
 - b. 15 watts in Digital Narrow mode: Quiet, full copy on both ends. Dave's signal began to break up at 5 watts, with the digital callsign containing intermittent errors. 10 watts reduced the errors and drop outs, 15 watts clean. 15 watts clean on Digital wide mode as well.

Repeater Pricing:

Normal Price: around \$1,700.

Discount price: \$500, per Yaesu agreement, current promotion ends 12/31/15. Must install and be running for a minimum of 1 year. Mac Lunn has offered to purchase this on behalf of the club. On Dec 10th, Yaesu representative noted that this offer does expire at the end of the month.

Additional Materials Needed: ADR interface (see below) to permit this repeater to cross link with the 220 machine, and also to connect with our existing controller. \$160. Connection cable between repeater and controller. TBD by Murray Scott.

One caveat with this repeater: It is not serviceable by us. Those who have had issues must send it back to Yaesu. They have been responsive to date. This is not unusual with the modern class of amateur radio transceivers. There have been others who have replaced the internal cables with LMR 400 patches to improve immunity to interference. Some repeater samples have also found these connections loose.

Description document of the insides: <http://www.otwc.net/no7rf-r/fusion/>



DR1-X Repeater front face



DR1-X Repeater front face, close up of the touch screen display.



*DR1-X Repeater with top lid removed. Receiver is on the left, transmitter on the right.
Both units are based on the Yaesu FTM-400XD mobile radio*



DR1-X Repeater transmit side, with heat sink and push and pull cooling fans

Repeater Description from Yaesu:

The repeater controller, receiver and transmitter are all packaged into a 19" standard cabinet rack mount panel unit for simple replacement of an existing repeater. Existing peripheral devices such as the duplexer and amplifier, etc., can continue to be used as-is.

Please see the DR-1 Brochure and Manual for installation examples of Repeater Set-Up replacing existing Analog FM Repeater

DR-1 Features

- Modulation Modes: Conventional FM, 12.5 kHz C4FM Digital (V/D Mode, VFR Mode, DFR Mode) *
- AMS (Automatic Mode Select) function automatically recognizes the signal as C4FM digital or conventional FM, and then the DR-1 repeater retransmits the signal using the preset communications mode.
- 3.5-inch Full Color Touch Panel Operation
- Extremely reliable, high RF Output Power: 50W/20W/10W
- Emergency Operation: Supports auto-switched backup battery power operation.
- Front panel microphone connector is provided for use in repeater transmitter testing, and enables use as a base station.
- Built-in large-size monitor speaker with front panel volume control

Other Feature

- Internal AC Power Supply
- 19" Rack Mount Available
- High Stability ± 2.5 ppm TCXO included
- DSQ (Digital Squelch Code) Signaling Feature
- CTCSS and DCS Signaling Feature
- ID Announcement Feature
- Remote Controller Interface
- Base Station Operation
- Time Out Timer
- Firmware Updates

DR-1 Supplied Accessories

- AC Cable
- DC Cable for backup battery
- PC Connection Cable SCU-20
- Rubber Feet (4)

DR-1 Options

- DTMF Microphone MH-48A6JA
- Hand Microphone MH-42C6J
- Voice Guide Unit FVS-2

DR-1 Specifications

Frequency range 144 to 148 MHz, 430 to 450 MHz
Channel steps 5/6.25 kHz
Emission type F1D, F2D, F3E, F7W
Frequency stability ± 2.5 ppm (-4°F to +140°F (-20°C to +60°C))
Antenna impedance 50 ohms
Supply Voltage AC 100 to 240 V
DC 11.7 to 15.8 V, negative ground
Current consumption:
1.5 A (Receive)
13 A (50 W TX, 144 MHz band)
14 A (50 W TX, 430 MHz band)
Operating temperature -4°F to +140°F (-20°C to +60°C)
Dimensions: 19"(W) x 3.5"(H) x 15"(D)
Weight : 22.05 lbs (10 kg) approximately

Transmitter

RF power output 50/20/5 W
Modulation type F1D, F2D, F3E Variable Reactance Modulation
F7W 4FSK (C4FM)
Spurious emission At least 60 dB below

Receiver

Circuit type Double conversion super-heterodyne
Intermediate frequencies 1st: 47.25 MHz, 2nd: 450 kHz
Receiver sensitivity
0.3 μ V (Digital 2 m/70 cm) BER 1%
0.2 μ V (FM 2 m/70 cm) 12dB SINARD
Adjacent Channel Selectivity Better than 65 dB TYP (20 kHz offset)
Selectivity FM 12 kHz/35 kHz (-6 dB/-60 dB)
Intermodulation Better than 65 dB TYP (20 /40 kHz offset)
Audio output 4 W (4ohm, THD 10%, 13.8 V; internal speaker)

Repeater hook up for Auto mode versus FM Fixed: <http://systemfusion.yaesu.com/faq/i-have-been-told-that-with-this-version-the-lockup-problem-when-using-an-external-controller-has-been-corrected-so-the-arcom-adr-is-not-needed-is-this-correct/>

Cause/Symptom: I have been told that with this version, the lockup problem when using an external controller has been corrected so the ARCOM ADR is not needed. Is this correct?

Solution: We are not aware of any lock up problem when using the Arcom ADR interface with the DR-1X. If the DR-1X is run in Fixed FM mode it can be used with an external controller. The ADR interface allows the DR-1X to be run in AUTO mode and use an external controller.

Conclusion: Yaesu recognizes the ADR is still required to operate the repeater in any mixed FM and C4FM mode.

ADR: Interface between the repeater and external controller to prevent repeater lock-up, and to allow the repeater to operate in digital mode with an external controller. This should allow us to maintain the cross linked repeaters to the 1 ¼ machine. Cost: \$160.

<http://www.arcomcontrollers.com/index.php/adr-interface>

The ADR Interface allows the connection of an external repeater controller to the Yaesu DR-1x Fusion Repeater while still retaining the automatic mode selection capability of the repeater. The DR-1x only allows the use of an external controller for analog operation of the repeater however.

While the ADR was designed for use with our RC210 in mind, it will work with any repeater controller on the market.

Need for the interface

The Yaesu DR-1x has some significant issues when being used with an external repeater controller. First and foremost, if your controller is connected as Yaesu recommends, the repeater is no longer capable of operation in digital mode. This is a distinct drawback. Secondly, if a digital signal does appear on the input while the external controller tries to transmit (such as sending an ID or other timed message), the DR-1x will lock up, requiring a power down/power up cycle to reset. This is obviously not a good thing!

What our ADR does is allow the external controller to take control of the repeater as long as there isn't current digital activity. If there is digital activity, the interface prevents the external controller from trying to key the repeater. As soon as the digital signal disappears and the DR-1x's transmitter drops (there is no hang time when in digital mode), the external controller may once again take control. The ADR also prevents digital signals from grabbing control from the external controller while its PTT is active. Both of these actions prevent the DR-1x from locking up. In addition, the ADR generates and carefully controls the application of PTT and other select signals the DR-1x requires in order to work with an external controller.

Cost of C4FM compatible radios:

FT-991	HF THRU 70CM C4FM DIGITAL ALL MODE 3.5 TFT DISPLAY	*\$1,199.95 After Rebate
FT-2DR	C4FM/FDMA Digital Touch Screen Dual Band Portable Transceiver	*\$399.95 After Rebate
FTM-100DR	2M/70CM DUAL BAND C4FM/FM MOBILE INC MH-48A6JA MIC	*\$339.95 After Rebate
FT-1XD	Black Dual Band Digital/Analog Xcvr - C4FM FDMA Now With 2200mAh Li-ion Battery	\$309.95
FT-1DR-HD BLACK	Black Dual Band Digital/Analog Transceiver - C4FM FDMA Now With 1800mAh Li-ion Battery	\$259.95
FTM-400XD	2M/70CM DUAL BAND MOBILE- Improved GPS	*\$539.95 After Rebate



The Livonia (Michigan) Amateur Radio Club (<http://www.livoniaarc.com>) are having our **Swap & Shop** on Sunday, February 21st from 8am till noon at the Livonia Seniors Center 15218 Farmington Road Livonia, MI 48154. Our swap flier and vendor application are attached. More information can be found on our swap page: <http://www.livoniaarc.com/index.php?page=swapshop>

Livonia Amateur Radio Club

Talk-in
145.35 with 100 PL
or 146.52 Simplex

45th ANNUAL SWAP-N-SHOP

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Electronic Test Equipment

Civic Park Senior Center
15218 Farmington Rd.
Livonia, MI

(SE corner of Farmington
Rd. and 5 Mile Rd.)

Call (734) 941-5043
or e-mail us at k8uns@arrl.net



*Lots of Tables
(8' tables for \$16 each
or \$17 pay pal
if paid in advance or
\$20.00 if available and
paid at the door)
*Door Prizes
*Food Concession
*Tickets \$5.00 or \$6
pal pal

Sunday, February 21, 2016 8:00am - 12:00pm

Livonia Amateur Radio Club 2016 Swap - N - Shop Table Reservation Form

The Livonia Amateur Radio Club
P.O. Box 51532, Livonia, MI 48151-5532 - 734-941-5043
K8UNS Repeater 145.350(-) E-mail: k8uns@arrl.net

Circle Desired Number of Advanced Tables
(Included is one paid admission per vendor application)

1 - 8' @ \$16	2 - 16' @ \$32	3 - 24' @ \$48	4 - 32' @ \$64
5 - 40' @ \$80	6 - 48' @ \$96	7 - 56' @ \$112	8 - 64' @ \$128

(Tables are \$17.00 each if paying by pay pal see our website)
(Tables are \$20.00 each if paying at the door and if available)

February 21, 2016, 8am-12pm (set up 6am Sunday)
Livonia Park Seniors Center
15218 Farmington Rd. (SE corner of Farmington Rd. and 5 Mile Rd.)
Livonia, MI

I request the table space circled marked above at the LARC swap: \$ _____
I request ____ advance additional TICKETS @\$5.00 each \$ _____
Enclosed is check for \$ _____, payable to Livonia Amateur Radio Club \$ _____

Name _____ Call Sign _____
Address _____
City _____ State ____ Zip Code _____ Phone _____
Remarks _____ Power (Y/N) _____
Items to be sold _____

SEND SELF-ADDRESSED, STAMPED, BUSINESS SIZE ENVELOPE FOR TICKETS AND CONFIRMATION

Your confirmations will be mailed with your tickets if your reservation is made prior to Feb. 15, 2016

Limited amount of electrical outlets are available in some areas, so bring **your** own long extension cord. If you requested power...just in case outlet is not near your table(s).

The CUT-OFF DATE for reserved table space by mail will be FEBRUARY 15th, or sooner if sold out. Get your table(s) early! All tables must be pre-paid in advance to expedite.



Club Repeater Information

The Ford Amateur Radio League operates 2 club repeaters under the club K8UTT license. All the repeaters are located in the Dearborn, MI area near the Southfield Freeway. All repeaters are open for members and guests to operate.

Repeater	Output Freq	Input Freq	Tone
2 M Repeater	145.270	-600 KHz	100 Hz PL
1 1/4 M Repeater	224.520	-1.6 MHz	100 Hz PL

Club Net: 8pm on Sunday, 2 and 1-1/4 Meter Repeaters!



Classes and Exams

The following amateur radio clubs conduct license exams throughout the year. Many clubs allow walk-ins but pre-registration will insure an exam is available for you when you attend.

Club Name	Contact Person	Phone	Email
Ford Amateur Radio League	Bill Boyke	313-805-8877	wboyke@ford.com
South Lyon ARC	Christian Anderson	248-437-3088	K8VJ@arrl.net
Motor City ARC	Don Novak	734-281-7030	K8THU@arrl.net
Hazel Park ARC	Jerry Begel	248-543-2284	w9npi@comcast.net
USECA ARC	Joseph Kennedy	586-977-7222	N8OZ@arrl.net
ARROW Assn	Roger Place	734-663-4625	merrogplace@aol.com

Some of the above clubs also conduct license classes. Please contact them for additional information.



2015-2016 Club Officers

Please contact any of the officers for information regarding the Ford Amateur Radio League, or go to the club website at www.k8utt.org for current events and activities.

President	Dave Treharne	N8HKU	734-476-1666
Vice President	Roger Reini	KD8CSE	734-728-1509
Treasurer	Pat Quinn	WD8JDZ	734-729-1993
Secretary			
Repeater Chair	Murray Scott	KE8UM	248-743-1704
K8UTT Trustee	Dave Treharne	N8HKU	734-476-1666
Activity Chair	Bill Boyke	N80ZV	313-805-8877
Bolt Editor	Rajiv Paul	KD8LHF	313-244-2515



Club Meetings

The Ford Amateur Radio Club meets on the second Thursday of each month, except for Christmas and the summer months July and August. The meetings are held at 6:30 PM at the Ford Engine Manufacturing & Development Offices (EMDO) building. EMDO (located at 17000 Southfield Rd, Allen Park, MI) is south of I-94 on the east side of Southfield just north of the Allen Park Municipal offices. Park in the front of the building and come into the main lobby at the side. Knock on the inside door on the right if no one is standing there to let you in.



Next Club Meeting: January 14, 2015 at 6:30PM

Topic: Club Yaesu FT-991 and 2015 Field Day in Review!

The Ford Amateur Radio League
PO Box 2711
Dearborn, MI 48123